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(54) Cosmetic containers, packages and process of manufacture

(57) A process for producing a molded plastic container for cosmetic material, by providing a molded polymeric container body having a continuous outer surface; applying a colored pattern constituted of discontinuous pattern elements to the continuous outer surface; thereafter applying to the continuous outer surface, over the colored pattern, a curable translucent coating of a lacquer containing a dye; and curing the applied lacquer coating.

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De cription

BACKGROUND OF THE INVENTION

This inv ntion relates to the provision of unusual and attractiv external surface appearance effects in containers for and packages of cosmetic materials. More particularly, it relates to processes for making molded plastic cosmetics containers having such surface appearance effects, and to the containers and packages thus produced. The term "package" as used herein refers to the combination of a container for cosmetic material and a quantity of cosmetic material disposed therein.

In an important specific aspect, the invention is concerned with imparting attributes of depth and subtlety of contrast or gradation to color patterns printed on or similarly applied-to smooth (e.g. convexly curved) outer surfaces of molded plastic containers. Typical patterns that may be used include nonsymbolic, and generally nonrepresentational, random or repeating designs (swirls, undulations, etc.) constituted of multitudinous small pattern elements such as halftone dots of colored ink applied to the container surface.

Tho typos of containors to which the invention is applicable are hollow containers that are made of an appropriate molding polymer such as clarified polypropylene, PVC, linear low density polyethylene, etc., and (depending on shape) are molded by injection, extrusion-blow, or injection blow techniques. Suitable materials and techniques for making these containers are well known and widely used in present day commercial production. The containers have smooth, continuous, generally rounded outer surfaces, and are frequently oval, square-round, conical (tapering) or otherwise noncylindrical, although cylindrical containers are also common. Examples of cosmetic materials with which the containers may be used include mascara, creams, lotions, shampoos and the like; often, these materials themselves have distinctive colors (the term "color" herein includes white). The containers may be translucent, in which case the color of the contained material contributes to the external appearance of the package, or they may be opaque.

Great importance is attached to the aesthetic appearance or visual effect of cosmetics packages, with emphasis both on distinctiveness (for product identification) and attractiveness (for consumer appeal). Thus, there exist a variety of approaches to the decoration of such packages, and especially the decoration of external surfaces of containers. Among these approaches, printing offers advantages of diversity of pattern and color as well as ease and economy of application, and is highly suitable for many types of package designs.

Usual decoration processes employing printing result in a high degree of contrast between printed and unprinted areas. It is sometimes desired, however, to provide a package design which is less artificial in appearance, i. . mor natural (as in nature, where different patterns and colors blend into each other), and is thus characterized by subtle or subdued transitions between printed and unprinted areas of a pattern.

Various techniques exist to achieve subtle patterns in the molding of a container, including co-extruding or injecting different colored materials in such a way that only a partial blend occurs. These techniques, although producing interesting effects, have several drawbacks, including the need for high capital investment in co-extrusion or co-injection equipment, difficulty of process control, difficulty in controlling translucency, and impossibility of creating a precise pattern.

SUMMARY OF THE INVENTION

An object of the present invention is to provide new and improved aesthetic effects in the appearance of cosmetics containers and packages.

A further object is to provide processes for producing cosmetics containers and packages having external aesthetic appearances characterized by depth effects and/or subtlety of pattern contrast or gradation.

Yet another object is to provide cosmetics containers and packages having such external aesthetic appearances.

To these and other ends, the invention in a first aspect broadly contemplates the provision of a process for producing a molded plastic container for cosmetic material, comprising providing a molded polymeric container body having a continuous outer surface; applying a colored pattern constituted of discontinuous pattern elements to the container outer surface such that the surface remains partially visible through the pattern; thereafter applying to the container outer surface, over the colored pattern, a curable translucent coating of a lacquer containing a dye; and curing the applied lacquer coating.

Further in accordance with the invention, in particular embodiments thereof, the step of applying the pattern is performed by printing the pattern on the container outer surface, preferably or advantageously by screen printing, or alternatively by offset printing. In certain currently preferred embodiments, the pattern is a halftone pattern and the pattern elements are dots, conveniently or preferably a pattern containing about 50 to about 70 dots per inch.

The pattern may be applied as a band extending entirely around the circumference of the container outer surface, and may have overlapping end portions to ensure complete pattern coverage of the surface with no unprinted gaps. In such case, when the pattern is a halftone pattern, the dots may be attenuated in the overlapping end portions of the band so that the overlap is not visually apparent.

As an alternative to printing, the step of applying the pattern may be performed by splatter spraying with an atomization pressure sufficiently low to form finite visible

droplets.

The lacquer employed in the final coating step is preferably a high solids content, ultraviolet-curabl lacquer, and that step is conveniently performed by spraying the container out r surface with the dye-containing lacquer. It is also currently preferred that the thickness of the cured lacquer coating be between about 3/4 mil and about one mil.

The molded polymeric body may be translucent, and may contain a dye. In such case, the cosmetic material contained in the interior reservoir or chamber of the container body may be visible through the container wall. affecting the external appearance of the cosmetics package. Alternatively, the molded polymeric body may be opaque. It may be cylindrical or non-cylindrical in shape. Molded of a suitable molding polymer, the body in particular instances (depending on materials used) may be treated, before the colored pattern is applied, to enhance the ability of the pattern and/or the lacquer coating to adhere to the container outer surface.

In further aspects, the invention contemplates the provision of a container for cosmetic material, produced as described above; and a cosmetics package, including such a container and a quantity of a colored cosmetic material contained therein, wherein the container body is translucent so that the contained cosmetic material is visible through the body wall and consequently contributes to the overall appearance of the package.

Further features and advantages of the invention will be apparent from the detailed description hereinbelow set forth.

DETAILED DESCRIPTION

The present invention will be described as embodied in a process of creating an appearance of depth and subtle color patterns in a molded plastic packaging that contains a cosmetic product, by applying a decorative colored pattern to the outer surface of the container (e. g. by printing) and subsequently spraying the thus-patterned container surface with a translucent coating of lacquer in which dye is incorporated. Such a container can be round, oval, or conic and, depending on shape, can be molded by injection, extrusion-blow, or injection blow techniques. Its outer surface is typically smooth and continuous around the entire circumference of the container body, which body defines an internal reservoir or chamber for holding a quantity of cosmetic material.

The described process can, for example, impart to a container a pattern giving a marble or tortoise-shell type of appearance, depending on the colors used. These colors can be used to mask to varying degrees the color of the product being packaged, by using translucent packaging.

The principle is as follows:

As in known practice, a colored cosmetics product, which may be a mascara, cream, lotion, shampoo, or the like, is packaged in a translucent or opaque pigmented molded container. Translucence is obtained by selecting an appropriat molding polymer, such as clarified polypropylene, PVC, linear low density poly thylene, etc., which is also suitable for the molding process, and the shelf life and physical performance required by the package. The wall thickness of the plastic gives an initial impression of depth through the slight degree of internal light reflection that occurs between the inner and outer surfaces of the container wall. Opacity is increased to variable levels by adding either dyes or pigments to the plastic. Certain polymers will require corona, flame, or plasma treatment to enhance the adhesion of subsequent decoration processes.

In accordance with the invention, the plastic container is decorated with one or several colors, typically applied by screen printing, offset printing, or spraying a splatter pattern. Screen printing is a standard well known technique which involves printing ink through a woven mesh which is selectively masked by a photographically hardened emulsion according to the pattern to be printed, and subsequently drying and curing the ink on the container. Offset printing is also a standard well known technique which involves printing a typically thinner film of ink from photographically prepared relief plates via a transfer blanket, to a cylindrical container, and subsequently drying and curing that ink. In splatter spraying, atomization pressure applied to the sprayed product is kept low so that finite visible droplets are formed rather than a visually continuous mist. As a result, in this technique, continuity of the finish is replaced by randomly deposited droplets while the part is spinning.

In any event, the colored pattern is constituted of discontinuous pattern elements so that the underlying container surface remains partially visible therethrough.

In this invention, the preferred method of decoration is screen printing due to its ability to be used to overlap on non-cylindrical shapes, which are very common in cosmetics packaging, and cannot be addressed by the offset process, and to provide controlled, repeatable patterns which can be more varied than simple sprayed patterns.

Screen printing machines are available that print several colors in one machine pass, thereby creating the possibility for more intricate patterns.

In screen printing, non-cylindrical shapes, such as oval or square-round, can be decorated with an overlapping band by employing a component-specific cam to direct the vertical motion of the squeegee and screen as the container rotates during the printing stroke. The printed band is allowed to overlap slightly so as to avoid the possibility of a non-printed gap, which might otherwise occur due to cumulative variations in geometry. It has also been found that non-parallel containers, i.e. slightly tapered containers, can be decorated in the same way. The inaccuracies and effects of decorating and varying differential speeds at the same tim along the container become hidden by later stages of the

pr sent process.

Advantageously, the applied colored ink pattern is a halftone pattern constituted of dots. A range of tonal values is obtained by creating a half-tone image of a desired pattern. Experience has found that the range of 50 to 70 dots per inch constitutes th best combination of detail, contrast, and practicably possible screen printing using this technique. Finer patterns tend to interfere with the mesh of the screen, and excessively reduce the contrast that results after the entire decorative process described here has been completed.

As mentioned earlier, a printed overlap is necessary so as to avoid any gaps in the decoration. Such an overlap can be unsightly if semi-opaque inks or halftone printing patterns are used. For this reason, the doubling of printing ink in the region of overlap is attenuated by employing a graduated halftone at the end of the band, so that the dot size tapers to zero in the anticipated overlap area.

If used alone to decorate a container, the colored pattern applied as described above would be vulnerable to criticism from the standpoint of visual quality. The halftone pattern would have too much contrast, and the overlap would be too variable; moreover, on a tapered container, the dots would slur from end to the other. In the present invention, such problems are overcome by subsequently spraying the entire container with a lacquer containing a translucent dye. The concentration of the dye is sufficient to attenuate the spurious effects mentioned above. The net effect of the superimposed result is to create a much more subtle effect by reducing the contrast of the decoration through over-lacquering.

The depth effect is obtained through the see-through characteristics of the superimposed layers: (a) the translucency (if any) of the plastic container, (b) the halftone pattern of the decoration, and (c) the translucency of the lacquer film over the decoration.

Adhesion between the superimposed layers is essential, as is good chemical resistance. Inadequate levels of each could cause serious problems following cosmetic product migration that always occurs in plastic packaging. Therefore, the choice of materials to be used in this process is important.

In the first place, if the component is molded in a polyolefin material such as polyethylene or polypropylene, a pretreatment is required to ensure full adhesion of the decorative layers. Experience has shown that the best treatment levels can be obtained using a known procedure referred to as "flame treatment." In this, the container is typically treated "on the fly" so as to avoid overheating and deformation of the container. Since the entire component must be treated in order to be suitable for all-over spray coating, stationary spinning under a flame-treating burner is unlikely to be suitable. Other known procedures for treatment are corona, glow discharge, and plasma treatment. These employ high voltage in either ambient conditions or under vacuum, sometimes with the aid of oxidizing gases and, in the case of plasma, radio frequency or microwave. In this invention, flame treatment has been found to be more effective for good adhesion of the materials used.

The printing ink used must be chemically resistant, adhere to th container, and allow adhesion of the superimposed lacquer. It has been found that the best results have been obtained using epoxy or epoxy-type inks that are polymerized under heat, such as Nazdaar 8100, available from the Nazdaar Corporation, or Colonial Monocat, available from the Colonial Ink Company. These are well established inks in the plastic cosmetics container decoration field. They have an advantage over ultraviolet cured inks in being able to be easily undercured so as to allow better adhesion of the lacquer topcoat. They also exhibit good chemical resistance to cosmetics products. Their inferior screen stability when compared to ultraviolet cured inks used for this type of fine decoration can to a large extent be compensated by using a very slow evaporating retarder such as butyl carbitol.

The lacquer top coat must equally be chemically resistant, and adhere to the components and the printing ink. Ultraviolet cured lacquers have been shown to have the best combinations of gloss, resistance, and coverage, and allow subsequent bulk packing through their hardness and resistance to scuffing and scratching. They are also more practical to cure at fast production rates, since polymerization only requires a few seconds, as opposed to minutes or hours at high temperatures, risky for container deformation, with heat curing systems. A heavy film weight, such as at least three quarters to one mil, creates a more cosmetic look, and covers more effectively any imperfections in or on the substrate. This is best obtained by using a high solids coating, for example at 50% solids content before spraying, at a sprayable viscosity of around 20 seconds, as measured by a Zahn #2 cup. An added advantage of high solids coatings is that they cause less solvent pollution to the atmosphere, if pollution control equipment is not used, and therefore are preferred by environmental regulatory agencies. The coating must allow the addition of dye, and in this respect acrylate type coatings, such as Type 106 from the Red Spot Company, are to be preferred to cationic epoxy systems, which have been found to be affected by the addition of dye.

The spraying of the container with the dye-containing lacquer is typically carried out on a chain-on-edge line that is designed to spin the part several times during the actual spraying process. Best spray quality, evenness, and economy is obtained using an electrostatic bell type system, e.g. of known type, that avoids using as much air as a conventional spray gun arrangement. With conventional non-electrostatic HVLP (high volume, low pressure) guns, color evenness is difficult to obtain and control on an irregular three dimensional translucent container, especially in areas where the spray patterns of separate guns overlap, due to the need to use a lot of compressed air to atomize and direct the spray

to the components. An electrostatic bell creat s a more controllable mist through disc spinning at up to 50,000 revolutions per minute, and the mist is further guided to the components through the electrostatic attraction provided by the metal part holders on the chain. In all, less air is required, and therefor spray is better controlled. The coating is dried after spraying, typically using medium wave infrared emitters for at least one to three minutes in order to obtain efficient substrate warm up, prior to the lacquer being cured under ultraviolet light, on the same chain-on-edge line. Ultraviolet curing typically requires about 5 to 10 seconds, rotating in front of two or three medium wave mercury lamps at 120 watts/inch, positioned in order to irradiate the entire geometry of the container without overheating. The entire spraying line is placed inside a class 10,000 or better clean room in order to limit dust inclusions while the sprayed film is still wet, which may be for several minutes to allow good solvent evaporation and film flowout.

In summary, the present invention avoids the difficulties heretofore encountered, in attempts to produce effects of depth and pattern subtlety in molded plastic cosmetic containers, by achieving a patterned effect through distinct and defined manufacturing steps allowing total control of the pattern, hue, and darkness of the colors involved. Furthermore, these steps employ typical equipment found in a decoration and coating manufacturing facility, and the partial hiding effect of the final lacquer coat allows unusual flexibility in the printing process. Most importantly, by using printing operations the pattern desired can be determined by prepared art work and design. It is not subject to an uncontrollable process.

The uniqueness of this invention is the combined use of several techniques in order to subdue the normal high contrast obtained by single decoration processes, between decorated and undecorated areas, using a decoration and topcoat system in order to give subtlety and depth to the final result. In currently preferred embodiments, these techniques are as follows:

(a) Using half-tone technique in printing in order to obtain less contrast, more tonal graduation.
(b) Using screen printing in order to address container shape irregularities, but maintaining decoration detail and repeatability.
(c) Merging printed overlaps on components by blending half-tones.
(d) Topcoating the whole with lacquer and incorporating a dye in the topcoat in order to further subdue the visual contrast of the whole.
(e) Topcoating using a high solids lacquer to accentuate the "depth" and cosmetic effect.
(f) Topcoating using electrostatic application in order to ensure even film weight and hence color consistency.

By way of further illustration of the invention, reference may be made to the following sp cific xample:

EXAMPLE

In this example, the process of the invention is employed to impart a special depth effect giving an appearance of "deep sea" to a container of elongated frustoconical shape about four inches long, injection blow molded in clarified polypropylene without addition of pigment or dye to the plastic so as to achieve see through.

A monochrome photograph is made of a marbleized pattern that gives randomly varying tones as desired in the final result. From the film positive of the image is made a half-tone image at 70 dots per inch by exposing a second photographic film to the first through a half-tone screen.

This resulting half-tone positive is used to photographically expose, using known techniques, a photosensitive emulsion applied to a framed mesh screen for screen printing. Ideally the screen has about 420 mesh per inch, but in practice a 305 mesh may be used to ensure that printing ink does not clog up and dry in the screen. A conventional air drying and curing ink (rather than ultraviolet cured) is used in order to facilitate adhesion between the layers of this decorative effect, ultraviolet typically achieving higher degrees of ink cross-linking, which can be detrimental to inter-layer adhesion.

In order to conform with the irregularity of the container, and cope with the differential peripheral speeds during rotary printing caused by the conicity (conical shape) of the container, the mesh is stretched to a lower than usual tension, such as 10 Newtons, which is about half a normal stretch.

The container is flame treated, using known techniques, over its entire surface, to achieve a surface tension of between 40 and 50 dynes per centimeter. This will ensure good adhesion of the ink and subsequent coating.

The width of the decoration area is equivalent to the periphery of the container at each point along its length plus about one eighth of an inch. This extra ensures that overlap is always achieved during printing. However, in order to avoid the doubling of ink film thickness in this area, the overlapping portion is exposed to a positive that ranges from zero opacity to full opacity over that width. This gives a tapering-off effect from the full tonal value of the original art work, to zero at the extreme edge of the image to be printed. When these extreme areas are overlapped, this tapering avoids doubling of the density of the printed image.

The container is printed either by positive drive or by friction from contact with the printing screen so that the rotation of the container averages that of the movement of the screen, so as to minimize slur produced by differential contact speeds between container and screen. The minimizing of slur due to the conicity of the container is aided by the relatively low stretch of the mesh on the frame.

The container is printed using an epoxy type ink such as Nazdaar type 8100, in this case blue, in order to get a deep sea look. The ink is retarded as much as possible so as to remain open on the screen, by using a slow solvent such as butyl carbitol. An epoxy type chemistry, involving cross-linking of the molecules of the resin portion of the ink, ensures resistance of the ink to any migrating components from the product that will eventually be packaged in the container.

The printed container is dried and cured at about 65°C for several minutes.

The dried container is then rotationally spray coated with a high solids type acrylate ultraviolet-curable solvent base coating, such as type 106 from Red Spot Ltd. Such a coating has a solvent content of around 4.2 lbs per gallon of coating, giving the possibility of laying down at least 15 to 25 microns of dried film weight. This gives the finished result better gloss and hiding of any surface defects or small dust particles of the raw container. In order to achieve the look desired, about 12 ounces of dilute blue dye solution are added to a gallon of coating, such as type 50216 from Westfield Coatings Ltd.

The sprayed container is dried in-line with spraying, preferably in clean-room conditions so as to avoid dust pick-up. Drying takes about 2 minutes, typically using medium or short wave infrared heat in order to encourage solvent evaporation. After drying, and also in-line under same conditions, the container is subject, in rotation to medium-wave ultraviolet light at about 120 watts per inch for about 5 to 10 seconds.

The resulting container has an overall blue look as seen by transparency. Under that, and somewhat subdued by the top coating, is a secondary blue pattern that varies around the width and length of the container according to the intended pattern.

It is to be understood that the invention is not limited to the features and embodiments hereinabove specifically set forth, but may be carried out in other ways without departure from its spirit.

Claims

1. A process for producing a molded plastic container for cosmetic material, comprising:

   (a) providing a molded polymeric container body having a continuous outer surface;
   (b) applying a colored pattern constituted of discontinuous pattern elements to said continuous outer surface so that the surface remains partially visible through the pattern;
   (c) thereafter applying to said continuous outer surface, over the colored pattern, a curable translucent coating of a lacquer containing a dye; and
   (d) curing the applied lacquer coating.

2. A process according to claim 1, wherein step (b) is performed by printing the pattern on said continuous outer surface.

3. A process according to claim 2, wherein step (b) is performed by screen printing.

4. A process according to claim 2, wherein step (b) is performed by offset printing.

5. A process according to claim 2, wherein said pattern is a halftone pattern and said pattern elements are dots.

6. A process according to claim 5, wherein said halftone pattern contains about 50 to about 70 dots per inch.

7. A process according to claim 2, wherein said surface has a circumference and said pattern is applied as a band extending entirely around said circumference and having overlapping end portions.

8. A process according to claim 7, wherein said pattern is a halftone pattern and said pattern elements are dots, and wherein said dots are attenuated in said overlapping end portions of said band.

9. A process according to claim 1, wherein step (b) is performed by splatter spraying with an atomization pressure sufficiently low to form finite visible droplets.

10. A process according to claim 1, wherein the lacquer is a high solids content, ultraviolet-curable lacquer.

11. A process according to claim 1, wherein step (c) is performed by spraying said continuous outer surface with the dye-containing lacquer.

12. A process according to claim 1, wherein the thickness of the cured lacquer coating is between about 3/4 mil and about one mil.

13. A process according to claim 1, wherein said molded polymeric body is translucent.

14. A process according to claim 13, wherein said molded polymeric body contains a dye.

15. A process according to claim 1, wherein said molded polymeric body is opaque.

16. A process according to claim 1, wherein said molded polymeric body is noncylindrical in shape.

17. A process according to claim 1, wherein step (a) comprises molding the container body of a molding

polymer.

18. A process according to claim 1, wherein step (a) further includes treating the molded body, before performing step (b), to enhance the ability of the pattern applied in step (b) and/or the coating applied in step (c) to adhere to said continuous outer surface.

19. A container for cosmetic material, comprising:

(a) a molded polymeric container body having a continuous outer surface;
(b) a colored pattern constituted of discontinuous pattern elements, applied to said continuous outer surface, the surface being partially visible through the pattern; and
(c) a cured translucent coating of a lacquer containing a dye, applied to said continuous outer surface over the colored pattern.

20. A cosmetic material package, comprising a container and a quantity of a colored cosmetic material contained therein, said container comprising:

(a) a molded translucent polymeric container body through which the contained cosmetic material is visible, said body having a continuous outer surface;
(b) a colored pattern constituted of discontinuous pattern elements, applied to said continuous outer surface, the surface being partially visible through the pattern; and
(c) a cured translucent coating of a lacquer containing a dye, applied to said continuous outer surface over the colored pattern.

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EUROPEAN SEARCH REPORT

Application Number
EP 98 30 0584

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	31 May 1999	Herrmann, J

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
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L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 98 30 0584

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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